

## CLAIM AMENDMENTS

1. (currently amended): A polypeptide which is a synthase or transferase obtainable from a bacterium of the family *Mycobacteriaceae*, such as of the genus *Propionibacterium* which:

- (a) acts as an amide synthase or a phospho-, nucleotidyl- or aryl transferase; or
- (b) has an activity within EC 6.3.1-, EC 2.7.7-, EC 2.7.8- or EC 2.5.1.17; and/or
- (c) is obtainable from a microorganism of the Sub order *Propionibacterineae* or *Propionibacteria freudenreichii*.

2. (canceled)

3. (currently amended): The A-synthase polypeptide according to claim 1 ~~[[or 2]]~~ comprising:

- (i) the amino acid sequence of SEQ ID No. 2, 4, 6 or 8; or
- (ii) a variant of (i) which is a synthase or transferase; or
- (iii) a fragment of (i) or (ii) which is a synthase or transferase.

4. (currently amended): The [[A]] polypeptide according to claim 3 ~~[[4]]~~ wherein the variant in (ii) has at least 70%, 75%, 80% or 85% identity to the amino acid sequence of SEQ ID No. 2, 4, 6 or 8 ~~(e.g. at least 85% identity to SEQ ID No. 8)~~ and/or the fragment of (iii) is at least 150 amino acids in length.

5. (currently amended): The [[A]] polypeptide according to ~~any preceding~~ claim 1 which is obtainable from a Gram positive bacterium and/or is a [[isa]] cobyrinic acid -a,c-diamide synthase, a cobinamide kinase, a cobinamide phosphate guanylttransferase, a cobalamin (5'-phosphate) synthase or an adenosyl transferase.

6. (currently amended): A polynucleotide comprising:

- (a) the nucleic acid sequence of SEQ ID No. 1, 3, 5 or 7 or a sequence encoding a polypeptide according to ~~any preceding~~ claim 1;
- (b) a sequence which is complementary to, or which hybridises to, a sequence as defined in (a);

- (c) a fragment of a sequence in (a) or (b);
- (d) a sequence having at least 60% identity to a sequence as defined in (a), (b) or (c); or
- (e) a sequence that is degenerate as a result of the genetic code to any one of the sequences as defined in (a) to (d).

7. (currently amended): The polynucleotide A-sequence according to claim 7 ~~[[7]]~~ wherein in (b) the hybridisation is under stringent conditions, the fragment in (c) is at least 20 bases in length ~~(such as at least 510 bases for a fragment of SEQ ID No. 7)~~ and/or the identity in (d) is at least 70% or 80% ~~(such as at least 85% for SEQ ID No. 7)~~.

8. (currently amended): The [[A]] polynucleotide according to claim 6 ~~[[or 7]]~~ which comprises:

(a) a sequence that encodes a polypeptide having synthase or transferase activity, which is:

- (1) the coding sequence of SEQ ID No. 1, 3, 5 or 7;
  - (2) a sequence which hybridises selectively to the complement of sequence defined in (1); or
  - (3) a sequence that is degenerate as a result of the genetic code with respect to a sequence defined in (1) or (2); or
- (b) a sequence complementary to a polynucleotide defined in (a).

9. (currently amended): The [[A]] polynucleotide according to claim 6 ~~any of claims 6 to 8~~ which is a DNA sequence.

10. (currently amended): A vector comprising one or more polynucleotide sequence(s) according to claim 6 ~~any of claims 6 to 9~~.

11. (currently amended): The [[A]] vector according to claim 10 which is an expression vector, ~~such as where a DNA sequence according to claim 9 is operably linked to a regulatory sequence.~~

12. (currently amended): A host cell which comprises at least one polynucleotide according to claim 6 ~~any of claims 6 to 9~~, or has multiple copies of one or more of the polynucleotide(s).

13. (currently amended): A host cell which comprises, as a heterologous sequence, a polynucleotide according to claim 6 ~~any of claims 6 to 9~~.

14. (currently amended): A host cell, optionally prokaryotic, transformed with the polynucleotide DNA sequence, according to claim 6 ~~any of claim 6 to 9~~ or a vector comprising the polynucleotide of claim 10.

15. (currently amended): A process of producing or synthesizing a polypeptide ~~according to any of claims 1 to 5~~ or vitamin B<sub>12</sub> or a precursor thereof, ~~the process~~ comprising culturing a host cell as defined in claim 12 ~~any of claims 12 to 14~~ under conditions that provide for expression of the polypeptide or synthesis of vitamin B<sub>12</sub> or the precursor.

16. (currently amended): A composition comprising a polypeptide according to claim 1 ~~any one of claims 1 to 5~~.

17. (currently amended): A process for the preparation of an amine, ~~the process~~ comprising contacting a substrate with an amide synthase from *Propionibacteria*, or a polypeptide comprising SEQ ID No. 2, or a variant or fragment thereof as defined in claim 3, ~~or a host cell as defined in any of claims 12 to 14~~.

18. (currently amended): The ~~[[A]]~~ process according to claim 17 wherein:

- (a) the process is conducted in the presence of glutamine which is optionally converted to glutamate;
- (b) a carboxyl group is amidated to form a carboxamide group;
- (c) the substrate is cobyrinic acid or cobyrinic acid c-diamide (Formula I or IA) and/or the product of the process is cobyrinic acid c-diamide or cobyrinic acid a,c-diamide (Formula IA or IB, respectively); and/or
- (d) the process comprises amidating a substrate.

19. (currently amended): A process for the preparation of a phosphate-containing compound, the process comprising contacting a substrate with a phosphotransferase from *Propionibacterium*, a polypeptide comprising SEQ ID No.4 or a variant or fragment thereof as defined in claim 3, ~~or a host cell as defined in any of claims 12 to 14.~~

20. (currently amended): The ~~[[A]]~~ process according to claim 19 wherein:

(a) the process ~~[[#]]~~ is conducted in the presence of a nucleoside triphosphate, such as ATP;

(b) the substrate comprises adenosine;

(c) the process comprises phosphorylation, optionally of a hydroxyl group; and

(d) the substrate comprises adenosyl cobinamide (Formula II) and/or the product of the reaction is adenosyl cobinamide phosphate (Formula IIA).

21. (currently amended): A process for the preparation of a nucleotidyl-containing compound, the process comprising contacting a substrate with a nucleotidyl transferase from *Propionibacterium*, a polypeptide comprising SEQ ID No. 4 or a variant or fragment thereof as defined in claim 3, ~~or a host cell as defined in any of claims 12 to 14.~~

22. (currently amended): The ~~[[A]]~~ process according to claim 21 wherein:

(a) the process comprises guanidylating substrate;

(b) the process comprises nucleotidylating a phosphate group;

(c) the process is conducted in the presence of a nucleosyl triphosphate, such as GTP; and/or

(d) the substrate comprises adenosyl cobinamide phosphate (Formula IIA) and/or the product of the reaction is adenosyl-GDP-cobamide (Formula IIB).

23. (currently amended): A process for the preparation of an aryl-containing compound, the process comprising contacting a substrate with an aryl transferase from *Propionibacterium*, a polypeptide comprising SEQ ID No. 6 or a variant or fragment thereof, as defined in claim 3, ~~or a host cell as defined in any of claims 12 to 14.~~

24. (currently amended): The ~~[[A]]~~ process according to claim 23 wherein:

(a) the aryl moiety comprises an aromatic ring system of one or two rings, optionally substituted with 1 to 4 C<sub>1-8</sub> alkyl groups, and with 0, 1 or 2 heteroatoms, optionally benzimidazole;

(b) the product of the reaction has the aryl group bound to a transition metal, such as cobalt, and to a carbon atom, optionally also to a ribose group;

(c) the process is conducted in the presence of a ribazole ~~ribozole~~; and/or

(d) the substrate comprises adenosyl-GDP-cobamide (Formula IIB) and/or the product comprises adenosyl-5,6-dimethyl benzimidazolyl cobamide (vitamin B<sub>12</sub>, Formula IIC).

25. (currently amended): A process for the preparation of an adenosine-containing compound, the process comprising contacting a substrate with an adenosyl transferase from *Propionibacterium*, or a polypeptide comprising SEQ ID No. 8 or a variant or fragment thereof as defined in claim 3, ~~or a host cell as defined in any of claims 12 to 14.~~

26. (currently amended): The ~~[[A]]~~ process according to claim 25 ~~[[24]]~~ wherein:

(a) the process comprises adenosylating a substrate, or the transfer of adenosine;

(b) the process ~~[[it]]~~ involves the bonding of adenosine to a metal atom, optionally a transition series metal ~~such as cobalt~~;

(c) is conducted in the presence of a nucleosyl (tri) phosphate, ~~such as ATP~~; and/or

(d) the substrate comprises cohydrinic acid a,c-diamide (Formula IB) and/or the product comprises adenosyl cohydrinic acid -a,c-diamide (Formula IC).

27. (currently amended): A process for producing vitamin B<sub>12</sub> or a precursor thereof, the process comprising culturing or fermenting a host cell according to claim 12 ~~any of claims 12 to 14~~ under conditions such that vitamin B<sub>12</sub> or the precursor ~~precursor~~ is produced or synthesised ~~(such as by the cell)~~.

28. (canceled)

29. (new): A vector according to claim 10 comprising:

a) a polynucleotide encoding a polypeptide wherein said polypeptide acts as a (phosphor)transferase or a (nucleotidyl)transferase or has an activity within EC 2.7.1.- or EC 2.7.7.- or is the amino acid sequence of SEQ ID NO:4 or a variant of said SEQ ID NO:4 or a fragment of said SEQ ID NO:4 or has at least 70%, 75%, 80% or 85% identity to the amino acid sequence of SEQ ID NO:4, or the nucleic acid sequence SEQ ID NO:3; and

b) a polynucleotide encoding a polypeptide wherein said polypeptide acts as an (aryl)transferase or has an activity within EC 2.7.8.- or it is the amino acid sequence of SEQ ID NO:6 or a variant of said SEQ ID NO:6 or a fragment of said SEQ ID NO:6 or has at least 70%, 75%, 80% or 85% identity to the amino acid sequence of SEQ ID NO:6, or the nucleic acid sequence SEQ ID NO:5.

30. (new): A vector according to claim 10 further comprising a nucleic acid sequence encoding the CobA protein.

31. (new): A vector according to claim 30 wherein the nucleic acid sequence encoding the CobA protein is from *P. freudenreichii*.

32. (new): The polynucleotide according to claim 7 wherein the fragment is at least 510 bases for a fragment of SEQ ID No. 7 and/or the identity is at least 85% for SEQ ID No. 7.

33. (new): The vector of claim 11 wherein the polynucleotide is a DNA sequence operably linked to a regulatory sequence.

34. (new): A process for the preparation of an amine, comprising contacting a substrate with a host cell as defined in claim 12.

35. (new): A process for the preparation of a phosphate-containing compound, comprising contacting a substrate with a host cell as defined in claim 12.

36. (new): A process for the preparation of a nucleotidyl-containing compound, comprising contacting a substrate with a host cell as defined in claim 12.

37. (new): A process for the preparation of an aryl-containing compound, comprising contacting a substrate with a host cell as defined in claim 12.

38. (new): A process for the preparation of an adenosine-containing compound, comprising contacting a substrate with a host cell as defined in claim 12.

39. (new): The process of claim 26 wherein the nucleosyl (tri)phosphate is ATP and the transition series metal is cobalt.

40. (new): A vector according to claim 10 comprising:

a) a polynucleotide encoding a polypeptide wherein said polypeptide acts as a (phosphor)transferase or a (nucleotidyl)transferase or has an activity within EC 2.7.1- or EC 2.7.7- or is the amino acid sequence of SEQ ID NO:4 or a variant of said SEQ ID NO:4 or a fragment of said SEQ ID NO:4 or has at least 70%, 75%, 80% or 85% identity to the amino acid sequence of SEQ ID NO:4, or the nucleic acid sequence SEQ ID NO:3; and

b) a polynucleotide encoding a polypeptide wherein said polypeptide acts as an (aryl)transferase or has an activity within EC 2.7.8- or it is the amino acid sequence of SEQ ID NO:6 or a variant of said SEQ ID NO:6 or a fragment of said SEQ ID NO:6 or has at least 70%, 75%, 80% or 85% identity to the amino acid sequence of SEQ ID NO:6, or the nucleic acid sequence SEQ ID NO:5 and further comprising a nucleic acid sequence encoding the CobA protein.

41. (new): A vector according to claim 40 wherein the nucleic acid sequence encoding the CobA protein is from *P. freudenreichii*.